UCRL-MA-133867

ESH and manual

Environment, Safety, and Health

Volume II

Part 19: Worker Capability/Physical or Repetitive Motion

19.1
LLNL Ergonomics Program

(Formerly H&SM S26.07)

Recommended for approval by the ES&H Working Group

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New document or new requirements

Approval date: September 12, 2000
Editorial Update: April 1, 2001

This work performed under the auspices of the U.S. Department of Energy by University of California Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.

19.1

LLNL Ergonomics Program[1]

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[1] **Minor revision**

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19.1

LLNL Ergonomics Program

1.0 Introduction

The Laboratory takes all reasonable precautions to protect the health and safety of its employees, the public, and the environment. As part of this commitment, LLNL has implemented the Ergonomics Program, whose primary objective is to prevent injuries and illnesses in the workplace. Other components of the program include work area evaluation, selection and use of appropriate equipment, and education and training.

This document describes the LLNL Ergonomics Program and its components. Contained herein are precautions for preventing upper-extremity injuries and illnesses, roles and responsibilities for all workers, basic ergonomics principles and practices, and the resources available to workers and supervisors for identifying and resolving ergonomic problems. Additional precautions and requirements for preventing injuries from lifting are given in Document 15.2, "Manual and Mechanical Material Handling," in the *Environment, Safety, and Health (ES&H) Manual*.

The term "ergonomics" refers to the relationship between individuals and their work environment. The problems addressed by ergonomics include improper "fit" of the workplace, poorly designed or improper tools, and poor body mechanics when lifting or performing repetitive tasks (including computer keyboard use).

The LLNL Ergonomics Program applies to all workers at LLNL. In addition to the services described in this document, the Laboratory provides formal diagnostic and treatment services to University of California employees. Contract employees, including supplemental labor and labor only, are fully covered by the preventive measures of this program.

2.0 Hazards

Failure to use (or improper use of) the precautions outlined in this document can lead to many different musculoskeletal illnesses and injuries, some of which can be debilitating. A musculoskeletal illness or injury is defined as an illness or injury of the muscles, tendons, ligaments, joints, cartilage, peripheral nerves, vascular system, or other related soft tissue.

3.0 Controls for Minimizing Ergonomic Hazards

3.1 Identifying a Possible Ergonomic Problem

Many ergonomic disorders are felt as strains and sprains. Acute or chronic muscle strain can be an indication that the capacity of the body to accommodate physical stressors has been exceeded. Acute muscle strain occurs when a concentrated episode has overstressed the musculoskeletal system. Chronic strain and cumulative trauma disorder (CTD) result from less-intense stresses that accumulate over time, reducing the rate of recovery of the musculoskeletal system.

3.1.1 Acute Muscle Strain

The signs and symptoms of acute muscle strain generally may include pain within 24 hours of an injury to the musculoskeletal system.

Most acute muscle strain injuries can be prevented. To prevent injuries:

- Use mechanical devices or additional personnel when lifting and moving heavy loads.
- Use proper body mechanics.
- Establish limits for lifting heavy objects.
- Avoid excessive fatigue from repeated forceful activities.
- Be in good physical condition.

Workers should report symptoms of acute muscle strain to their work supervisor and then report to the Health Services Department.

3.1.2 Cumulative Trauma Disorder

The signs and symptoms of CTD of the upper extremities include pain, numbness, and tingling of the fingers, wrist, elbow, or shoulder. Chronic back and neck problems may result in pain, numbness, or tingling that radiates to the arms or legs, as well as limited back motion. Doing the following usually can prevent these problems:

- Use ergonomically designed tools and workplaces (e.g., furniture that has adjustment flexibility and allows for proper posture).
- Educate workers to adhere to ergonomically appropriate work habits (e.g., maintaining the proper posture and using a light touch when doing keyboard work).

- Vary physical activities appropriately to allow frequent, short rest periods during which tendons and muscles are not subjected to repetitive strain or sustained contraction (see Section 3.3.4).
- Assess, intervene, and evaluate symptoms early. Early intervention is essential to quick recovery and long-term prevention of CTD.

It is extremely important for workers to report any recurrent symptoms of CTD (e.g., pain, numbness, tingling, or tenderness) to their work supervisor and the Health Services Department.

3.2 Computer Workstation Evaluation Procedure

A work supervisor is responsible for ensuring that each worker's workplace is configured properly. However, workers with concerns may request that their work supervisor arrange for a workstation evaluation.

In general, the work area ergonomic evaluator assigned by a manager should complete workstation evaluations. The education needed to fulfill the role of a work area ergonomic evaluator is defined in Section 3.7. An evaluation shall assess the physical configuration of a workstation (see Section 3.3) and assist workers in identifying risk-related work habits.

The work area ergonomic evaluator completes an Ergonomic Evaluation form (see Appendix A) or equivalent, and reviews the form with the worker and his/her work supervisor, both of whom receive a copy of the form. The evaluator also should retain a copy. If a health problem is noted, the worker shall be referred to the Health Services Department.

Workers and their supervisors shall make furniture adjustments or order furniture or other equipment to resolve problems identified during the evaluation.

If the work area ergonomic evaluator is not available or cannot resolve a concern, the work supervisor should contact the Hazards Control industrial safety engineer. If a worker has medical symptoms, the work supervisor shall advise him/her to report to the Health Services Department. The Health Services Department can perform workstation evaluations for individuals who have an established injury or illness.

3.3 Ergonomic Design and Practices

3.3.1 Computer Ergonomics

A frequent contributor to CTD is improper configuration and use of computer workstations. Changes to a workstation may require only repositioning furniture or equipment or purchasing ergonomically appropriate replacements. Figure 1 shows a well-designed computer workstation. In addition, some key items of a properly designed computer workstation are described in this section and should give workers a general idea of how to set up their workstations correctly. Plant Engineering also is available to assist in the planning and design (or redesign) of work areas.

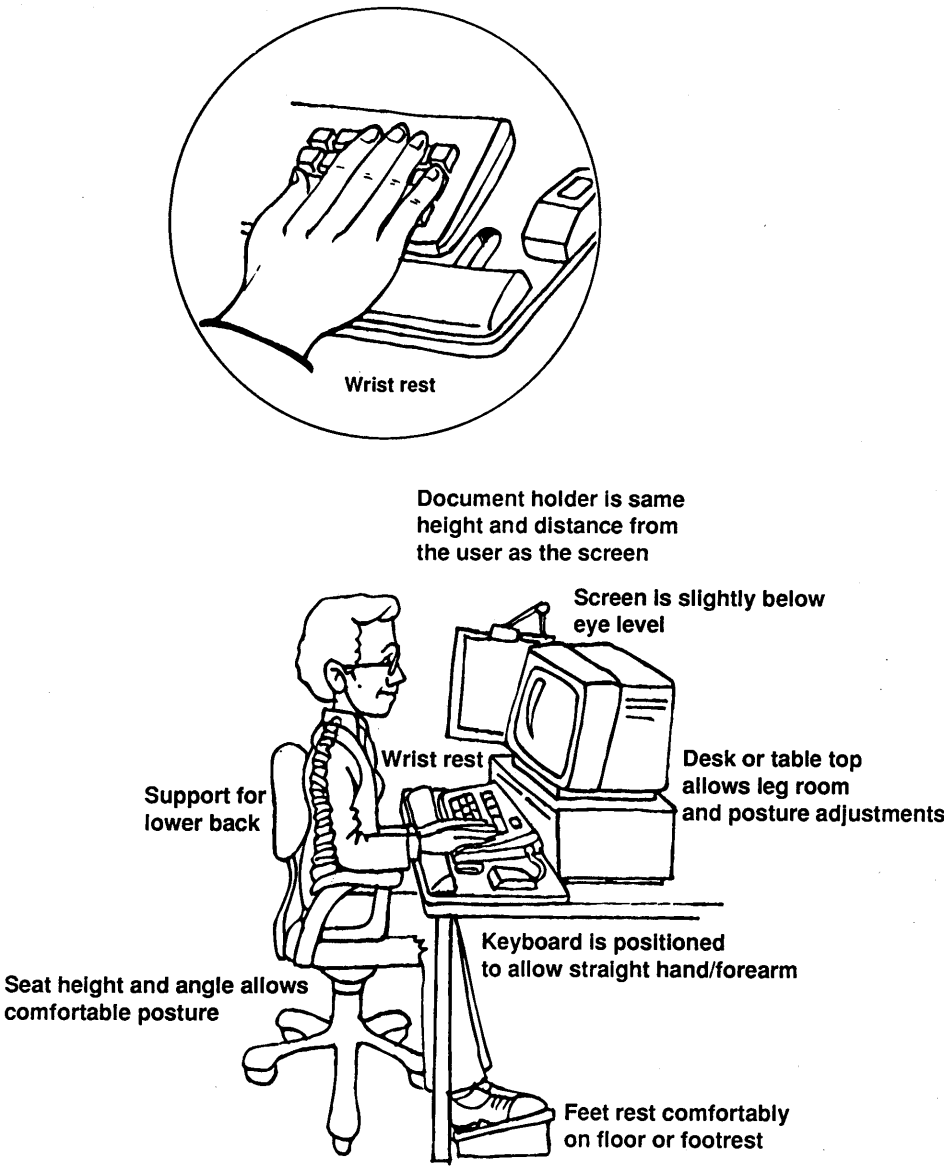

Figure 1. A well-designed computer workstation.

Chair. A chair should have an adjustable back that provides support for the lumbar region of the back and trunk. A chair also should be easily adjustable in height to permit the feet to rest flat on the ground, with the legs parallel to the floor. Some people may need a footrest to achieve this position. Chairs should have a five-star base and casters compatible with the floor surface. Armrests should be of a padded material and adjustable in height. The seat pan should be large enough to be comfortable.

Work surface. A work surface should be large enough to accommodate all computer equipment, including a wrist rest in front of the keyboard and input device. A keyboard tray can be used to increase the depth of the workstation and viewing distance from the monitor. Sufficient room should be provided under a work surface to allow free leg movement. The height of the work surface should allow the forearms to be parallel with the floor while working at the computer.

Keyboard and input device. A keyboard and input device (mouse or trackball) should be at the same level and in front of the operator. The height of the keyboard and input device should allow the operator to position his/her forearms and hands parallel to the floor during operation. This position can be achieved by adjusting the height of the chair, armrest, or table or by using an adjustable tray. A wrist rest for a keyboard and input device should be used to prevent the operator's wrists from coming in contact with the work surface when the arms are at rest.

Terminal. A terminal (i.e., monitor) should be located directly in front of the operator, and the top of the screen should be approximately at eye level or slightly lower.

Vision. Although often overlooked, vision is a critical part of the workstation composition. An annual eye examination is recommended to ensure that any changes in vision are detected and corrected. The viewing distance (i.e., the distance between an operator's eyes and a monitor) should be about an arm's length, and operators should periodically look away from the computer to a distant object to relax the eye muscles.

Personnel in the Hazards Control Department Safety Glasses Office (B663) provide special computer glasses, at no cost, to workers who work at computers for more than two consecutive hours or for more than four hours a day. (UC employees and supplemental labor workers can receive computer glasses if they provide a cost account number.)

Lighting and glare. A monitor should be positioned in a location where outside or overhead light does not reflect off the screen. Blinds, drapes, or glare screens may be used to reduce glare. Light bulbs can be removed from light fixtures to reduce brightness or glare. Generally, a monitor should be placed at a right angle to a window.

3.3.2 Hand Tool Ergonomics

Below are some key points to remember when selecting or purchasing hand tools. Following such points can help prevent CTD.

- Avoid tools that produce a bent wrist position. The ideal wrist position is neutral (i.e., straight). This position should be maintained while performing work. Figure 2 shows the correct position of the wrist when using hand tools.

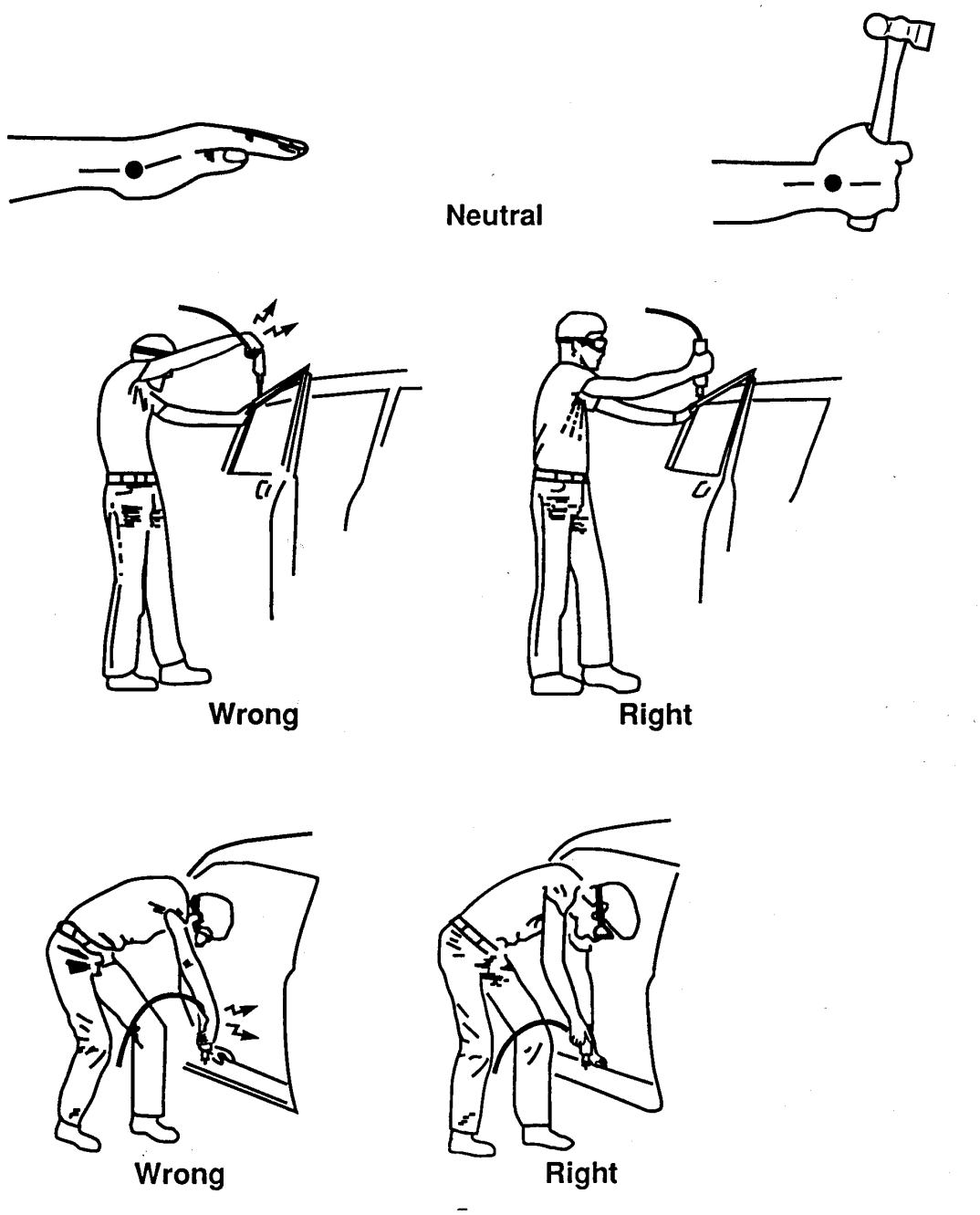

Figure 2. Correct positions for holding hand tools.

- Select hand tools that fit workers' hands (see Fig. 3). A tool that is too large or too small produces stresses in the hand and wrist. As a general rule, the ideal handle diameter is 1.5 in. for a man and 1.3 in. for a woman.
- Do not select a tool so large as to be difficult to hold.
- Select power or pneumatic tools with built-in vibration dampening (see Fig. 4).

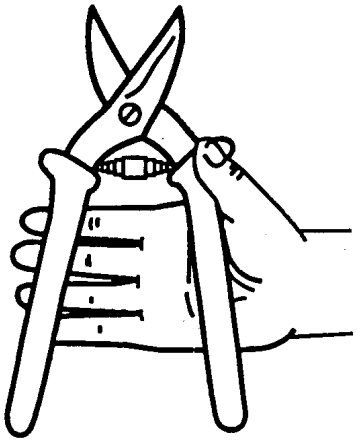

Figure 3. Reasonable hand grip for tool.

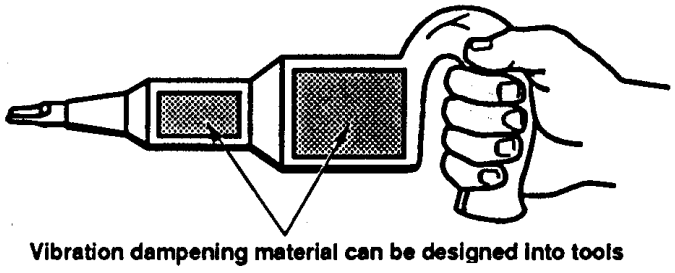

Figure 4. Power or pneumatic tool with built-in vibration dampening.

- For tools that are activated by a trigger, choose a grip size that allows activation with the middle part of the fingers. Activation with the fingertips can create nodules on nerve sheaths and cause a type of CTD known as trigger finger.
- Use a soft covering on a tool handle to protect the hands from heat and cold and to help reduce pressure points, vibration, and slipperiness of the grip. Such covering encourages a more relaxed hold on the tool (see Fig. 5).

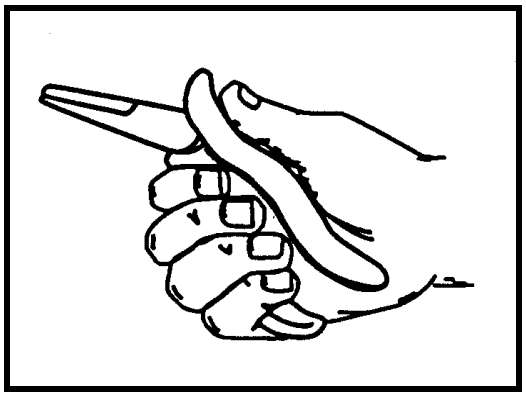

Figure 5. Soft covering for tool handle.

For more information on hand tools, take Course HS5311, "Ergonomics—The Selection and Use of Hand Tools." For details about this course, see the online course catalog, which can be found at the following Internet address:

https://www-ais.llnl.gov/llnl_only/docs/hr/catalog/

3.3.3 Other Workplace Ergonomics

In addition to computer workplaces, there are many other work settings (e.g., material fabrication, circuit-board fabrication, painting, gardening, office moves, and custodial work) where ergonomic practices are important and the effects of CTD are evident. The basic ergonomic guidance provided below may help avoid CTD.

- Respect pain. If an activity causes pain or discomfort, stop and evaluate the activity to look for alternative approaches. Change positions if the activity is causing pain or discomfort.
- Alternate tasks during the workday to interrupt repetitive activities.
- Keep the wrists in the neutral position whenever possible.
- Use two hands whenever possible, even when handling light objects or doing small tasks.
- Make several trips with lighter loads. Use a cart or dolly, if necessary.
- To avoid the use of a sustained, forceful grip, use a vice, clamp, or jig to stabilize objects.

Back injuries represent a significant number of CTD cases. Therefore, a review of Document 15.2 is recommended for detailed guidance on lifting and moving objects.

For workplace evaluations, contact your area ES&H Team.

3.3.4 Alternate Work Periods

Workers who have the highest risk of developing CTD include those who perform continuous, high-intensity, repetitive tasks that cause stress on the same body parts. An alternate work activity totaling five minutes for every 30 minutes of work is necessary for such individuals. Alternate activities allow the muscles and tendons time to recover from repetitive motion tasks and do not include repetitive motion activities, such as keyboarding, use of hand tools or floor buffers, material handling, or other similar work. If necessary, Hazards Control industrial safety engineers are available to assist supervisors in determining which workers fit into this high-risk category.

3.4 Ergonomic Management by the Health Services Department

Laboratory employees with symptoms of CTD or acute injuries to the musculoskeletal system (including early signs of CTD) are required to report promptly to the Health Services Department for an evaluation and, if needed, treatment.

The Health Services Department provides the following services:

- Diagnosis, treatment, and management of acute musculoskeletal injuries and CTD, including return-to-work evaluations.
- Worksite evaluations for workers with ergonomics-related injuries or illnesses.
- Consultation on complex ergonomic problems and ergonomic program development.

For more information about the medical services offered for ergonomic injuries, contact the Health Services Department.

3.5 Recordkeeping

Records of workplace evaluations performed by a work area ergonomic evaluator or industrial safety engineer shall be retained in accordance with *Lawrence Livermore National Laboratory Records Retention Schedule,* which can be found at the following Internet address:

(https://www-ais.llnl.gov/llnl_only/docs/bsd/records/retention/).

The Hazards Control Department maintains a database that includes information relevant to ergonomic injuries and illnesses (including the injury and illness logs required by OSHA). The Health Services Department also maintains LLNL employees' medical records, which are confidential.

3.6 Program Evaluation

The LLNL Ergonomics Program is evaluated periodically to determine whether established objectives are being met and whether revisions to the program are necessary. The program's primary objective is to reduce ergonomic injuries and illnesses in the workplace. The relevant indicators are monitored and evaluated.

3.7 Education and Training

Education and training are key aspects of the LLNL Ergonomic Program. Supervisors and workers should receive sufficient information and education to recognize ergonomic risk factors, to understand the nature of ergonomic injuries and illnesses, and to be aware of potential corrective measures and the resources available.

Ergonomic evaluators must take Courses HS5316-W, "VDT Ergonomics—Keymoves," and HS5312, "VDT Ergonomics for Supervisors / Evaluators—Basic."

Individuals assigned to continuous, high-intensity, repetitive computer tasks that repeatedly stress the same body parts without interruption for four hours or more a day shall receive education and training through Course HS5310, "VDT Ergonomics," or HS5316-W, "VDT Ergonomics—Keymoves."

The following additional courses are recommended:

- HS5300, "Back Care Workshop"
- HS5311, "Ergonomics—The Selection and Use of Hand Tools"
- OH1003, "Healthy Backs"
- OH8002, "Back Injury Prevention"
- OH8003, "Preventing Back Injuries during Office Moves"

For more specific details on the above courses, refer to the online course catalog. All completed training must be entered into the Livermore Training Records and Information Network (LTRAIN).

4.0 Responsibilities

General responsibilities for all workers are described in Document 2.1, "Laboratory and ES&H Policies, General Worker Responsibilities, and Integrated Safety Management," in the *ES&H Manual*. Specific responsibilities with regard to the LLNL Ergonomics Program are listed under each title below.

4.1 Directorates

- Implement ergonomic-related health and safety programs.
- Ensure that ergonomics are considered when conducting hazard or risk assessments and root-cause analyses.
- Support corrections to ergonomic problems by ensuring that the proper education and resources are available to supervisors and workers.
- Ensure that programs are in place to evaluate the workplace for proper ergonomic practices and conditions.
- Maintain a sufficient number of trained ergonomic evaluators to conduct computer workstation evaluations. The availability of a trained individual in a work area makes it possible to perform simple workstation evaluations and resolve complicated problems in a timely and cost effective manner.
- Ensure that new furniture purchased for workstations has adjustment flexibility.

4.2 Supervisors

4.2.1 Payroll Supervisor

- Ensure that workers receive appropriate ergonomics education (see Section 3.7).

4.2.2 Work Supervisor

Note that the responsibilities listed below apply to the work supervisor. However, the payroll supervisor also may be responsible for these activities. In some cases the work supervisor may also be the payroll supervisor.

- Respond to workers' concerns regarding ergonomic problems.
- Seek assistance from the Hazards Control Department, Health Services Department, and Plant Engineering when necessary.
- Ensure that computer workstation evaluations are conducted, as necessary.
- Implement ergonomic recommendations in consultation with the Hazards Control Department and / or Health Services Department and provide follow-up.
- Promptly refer all injured or ill employees to the Health Services Department.

- Ensure that workers who engage in intensive, highly repetitive work (as defined in Section 3.3.4) have the opportunity for frequent, short, alternate work activities.
- Ensure that the work environment is appropriately evaluated for proper ergonomic practices and conditions.
- Make ergonomic evaluations a part of ongoing workplace assessments.
- Apply ergonomic principles when workplace changes are being considered.
- Coordinate workplace furniture planning with Plant Engineering Furniture / Interior Design Services personnel.

4.3 Non–Hazards Control Department Ergonomic Evaluator

An ergonomic evaluator is normally a directorate or department staff member who shall:

- Complete Courses HS5316-W, "VDT Ergonomics—Keymoves," and HS5312, "VDT Ergonomics for Evaluators / Supervisors—Basic." In addition, maintain the appropriate skill level to resolve simple ergonomic problems involving workstations.
- Conduct workstation evaluations in specific work areas, as assigned.
- Refer complicated workstation evaluations to a Hazards Control industrial safety engineer or the Health Services Department.
- Provide educational materials to workers and serve as a work-area informational resource person.
- Refer employees complaining of pain or discomfort to the Health Services Department.
- Retain copies of workstation evaluations in accordance with *Lawrence Livermore National Laboratory Records Retention Schedule*, which can be found at the following Internet address:

  https: / / www-ais.llnl.gov / llnl_only / docs / bsd / records / retention /

- Make recommendations for ergonomic improvements in the workplace.

4.4 Workers

- Promptly report ergonomic problems or concerns to your work supervisor. Prompt implementation of workplace changes can significantly reduce the potential for severe injuries or illness.
- Follow ergonomic work practices and guidance provided by the Laboratory.

4.5 Hazards Control Department

- Provide guidance on modifying the workplace to minimize the potential for injuries and illnesses.
- Provide information about ergonomic issues to increase the awareness of workers, supervisors, and managers.
- Analyze injuries and illnesses to determine potential ergonomic causes.
- Maintain Department-generated workstation evaluations and ergonomics records in accordance with *Lawrence Livermore National Laboratory Records Retention Schedule,* which can be found at the following Internet address:

  https://www-ais.llnl.gov/llnl_only/docs/bsd/records/retention/

- Evaluate individual workstations, as requested.
- Evaluate and advise workers and supervisors on the selection of ergonomically sound workstation furniture and equipment.
- Assist supervisors, if necessary, in determining which workers require education (see Section 3.7) or alternate work activities.

4.6 Health Services Department

- Provide diagnosis, treatment, and medical management of CTD and acute strains to the musculoskeletal system.
- Evaluate the workstations of individuals with injury or illness.
- Provide consultation and analysis for complex ergonomics problems.

4.7 Plant Engineering

Plant Engineering Furniture/Interior Design Services provides advice on the selection of ergonomically sound workstation furniture and processes all furniture purchases.

4.8 Risk Management Office, Human Resources Department

The Risk Management Office provides management oversight of LLNL's Workers Compensation Program, including costs for medical treatment and services and other related workers compensation costs.

5.0 Work Standards

10 CFR 1046, Appendix A, Subpart B, "Physical Protection of Security Interest."

DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," Attachment 2, "Contractor Requirement Document," Sections 1–11, 13–18 (delete item 18.a), 19 (delete item 19.d.3) and 22.

Public Law 91-596 § (5)(a)(1), OSHA General Duty Clause.

UCRL-AR-129931, *LLNL Ergonomics Standard*.

UCRL-AR-129189, *Lawrence Livermore National Laboratory Occupational Medicine Standard: Medical Evaluation of Employee*s.

6.0 Resources for More Information

6.1 Contacts

For further information on the topics below, contact the following as necessary:

- ES&H Team industrial safety engineer—Workplace evaluations and concerns, consultations, or questions.
- Health Services Department—Medical and workplace evaluations of individuals with injuries and illnesses.
- Safety Programs Division, Hazards Control Department—Ergonomic-related illnesses and injury statistics and records.
- Education, Training, and Safety Analysis Group, Hazards Control Department—Training information and registration.
- Plant Engineering Furniture / Interior Design Services—Consultation for planning and designing or redesigning work areas.
- Risk Management Office, Human Resources—Matters concerning the Workers Compensation Claims Program.

6.2 Lessons Learned

Refer to the following Internet address for lessons learned applicable to ergonomic:

http://www-r.llnl.gov/es_and_h/lessons/lessons.shtml

6.3 Other Sources

California Occupational Safety and Health Standards, Title 8, Section 5119, "Ergonomics" (July 3, 1997).

National Institute for Occcupational Safety and Health, Department of Health and Human Services, "Elements of Ergonomics Programs, A Primer Based on Workplace Evaluations of Musculoskeletal Disorders," NIOSH Publication No. 97-117 (March 1997).

Appendix A

Ergonomic Evaluation Form

ERGONOMIC EVALUATION

Name: Date: Bldg: Rm:

Sex: Phone No: Payroll No: L-Code:

Job Title:

Employer:

Supervisor: Phone: L-Code: Notified?

Evaluation Requested By: ☐ Supervisor ☐ Employee ☐ Medical

Reason for Evaluation: ○ Preventive ○ Reactive SAAR Number:

ITEMS CHECKED/ADJUSTED:

Chair/Model	
Footrest	
Worksurface	
Monitor/Glare Screen	
Keyboard/Wristrest	
Mouse/Trackball	
Copy Holder	
Lighting	
Vision	
Telephone	
Comfort Level	
Breaks Exercise	
Comments	

ERGONOMIC EVALUATION

RECOMMENDATIONS:

ITEM	DESCRIPTION	PART NO.	COST
Chair			
Footrest			
Wristrest			
Keyboard Tray			
Glare Screen			
Copy Holder			
Headset			
Other			
Other #1			
Other #2			
Other #3			
		TOTAL COST	

Work Surface
Lighting
Vision
Breaks/Exercise

Comments

Evaluator **Phone No.** **L-Code**

cc: Ergonomics File

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